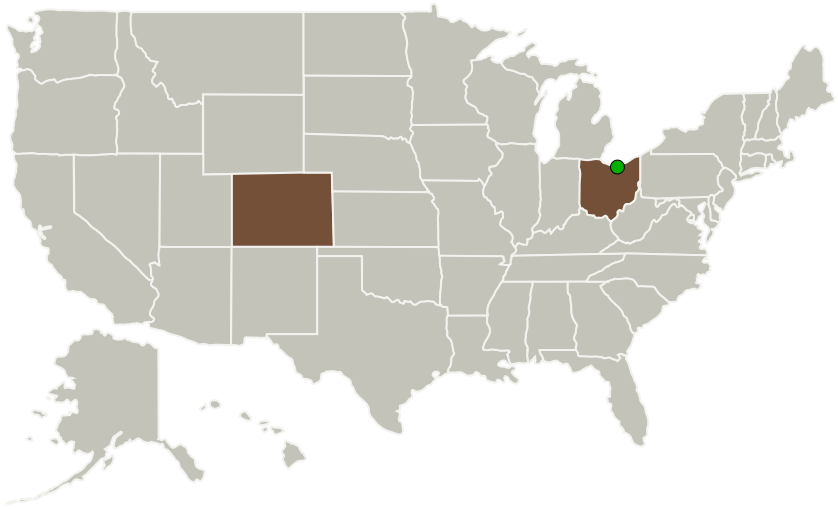
Simulation Tool for Dielectric Barrier Discharge Plasma Actuators at Atmospheric and Sub-Atmospheric Pressures, Phase I

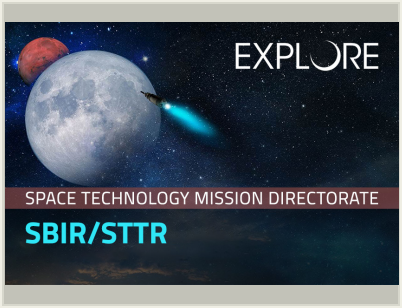
Completed Technology Project (2010 - 2010)

Project Introduction

Traditional approaches for active flow separation control using dielectric barrier discharge (DBD) plasma actuators are limited to relatively low-speed flows and atmospheric conditions. It results in low feasibility of the DBDs for aerospace applications, such as active flow control at turbine blades, fixed wings, rotary wings and hypersonic vehicles, which require a satisfactory performance of the DBD plasma actuators at wide range of conditions, including rarified flows and combustion mixtures. An optimization of the DBD plasma actuators should be achieved using efficient, comprehensive, physically-based DBD simulation tool for different operation conditions. We propose to develop a DBD plasma actuator simulation tool for a wide range of ambient gas pressures. The proposed tool will treat DBD plasma kinetically at low pressures. At high pressures (atmospheric conditions) plasma will be treated using hydrodynamic approach. The proposed tool will be validated by comparison with the experimental and numerical data on the DBD investigations.

Primary U.S. Work Locations and Key Partners





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Organizations Performing Work	Role	Type	Location
Tech-X Corporation	Lead Organization	Industry	Boulder, Colorado
Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations	
Colorado	Ohio

Project Transitions

January 2010: Project Start

July 2010: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/139939)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Tech-X Corporation

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

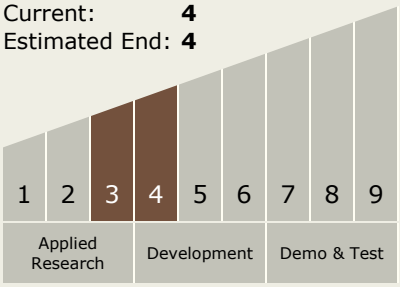
Carlos Torrez

Principal Investigator:

Alexandre Likhanskii

Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **4**



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Technology Areas

Primary:

- TX15 Flight Vehicle Systems
  - TX15.1 Aerosciences
    - TX15.1.5 Propulsion Flowpath and Interactions

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System